FIG. 1

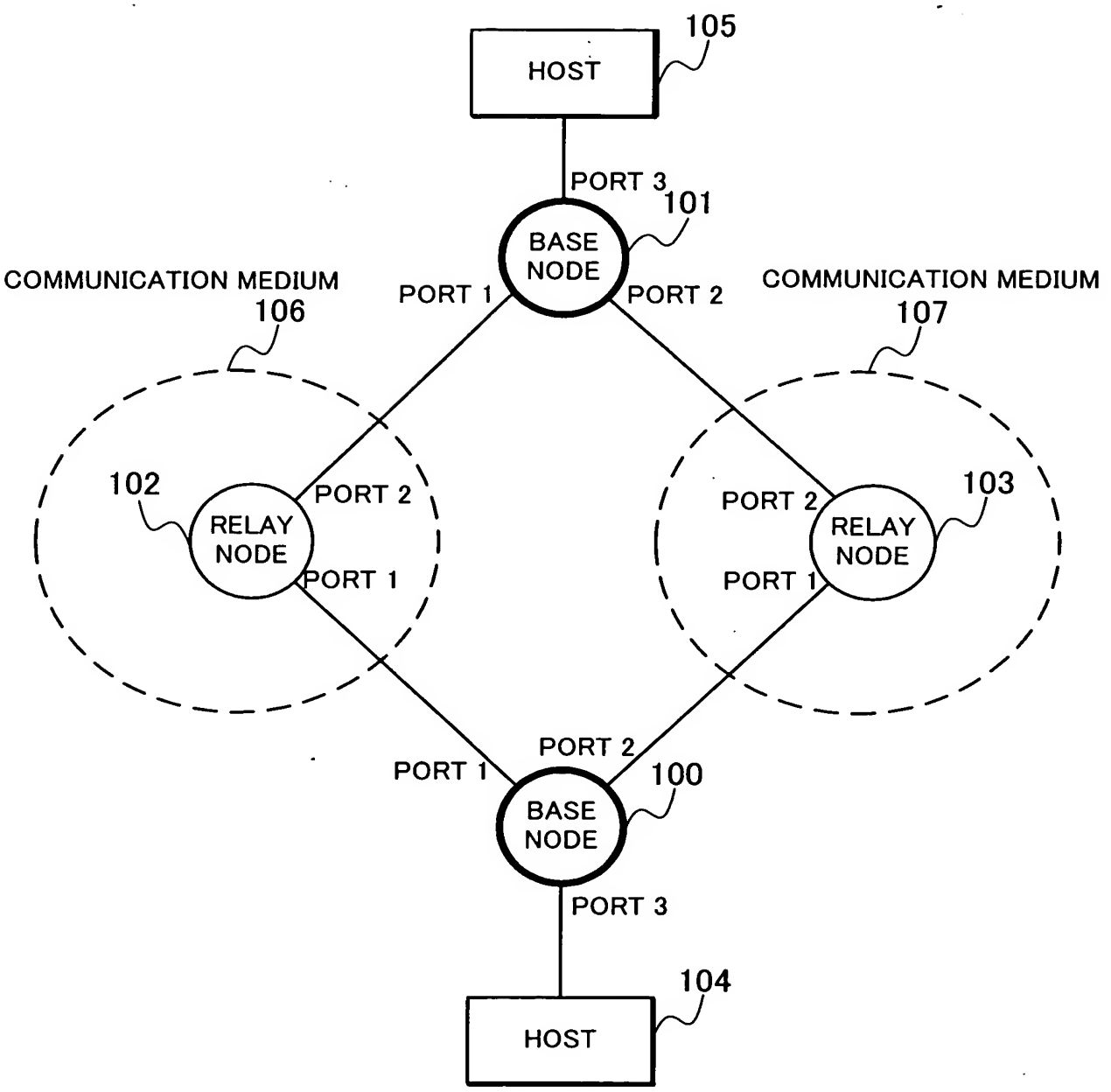

HOST
105
PORT 3
101
BASE NODE
COMMUNICATION MEDIUM
106
PORT 1
PORT 2
COMMUNICATION MEDIUM
107
102
RELAY NODE
PORT 2
PORT 1
PORT 2
RELAY NODE
103
PORT 1
PORT 2
PORT 1
100
BASE NODE
PORT 3
104
HOST

FIG. 2

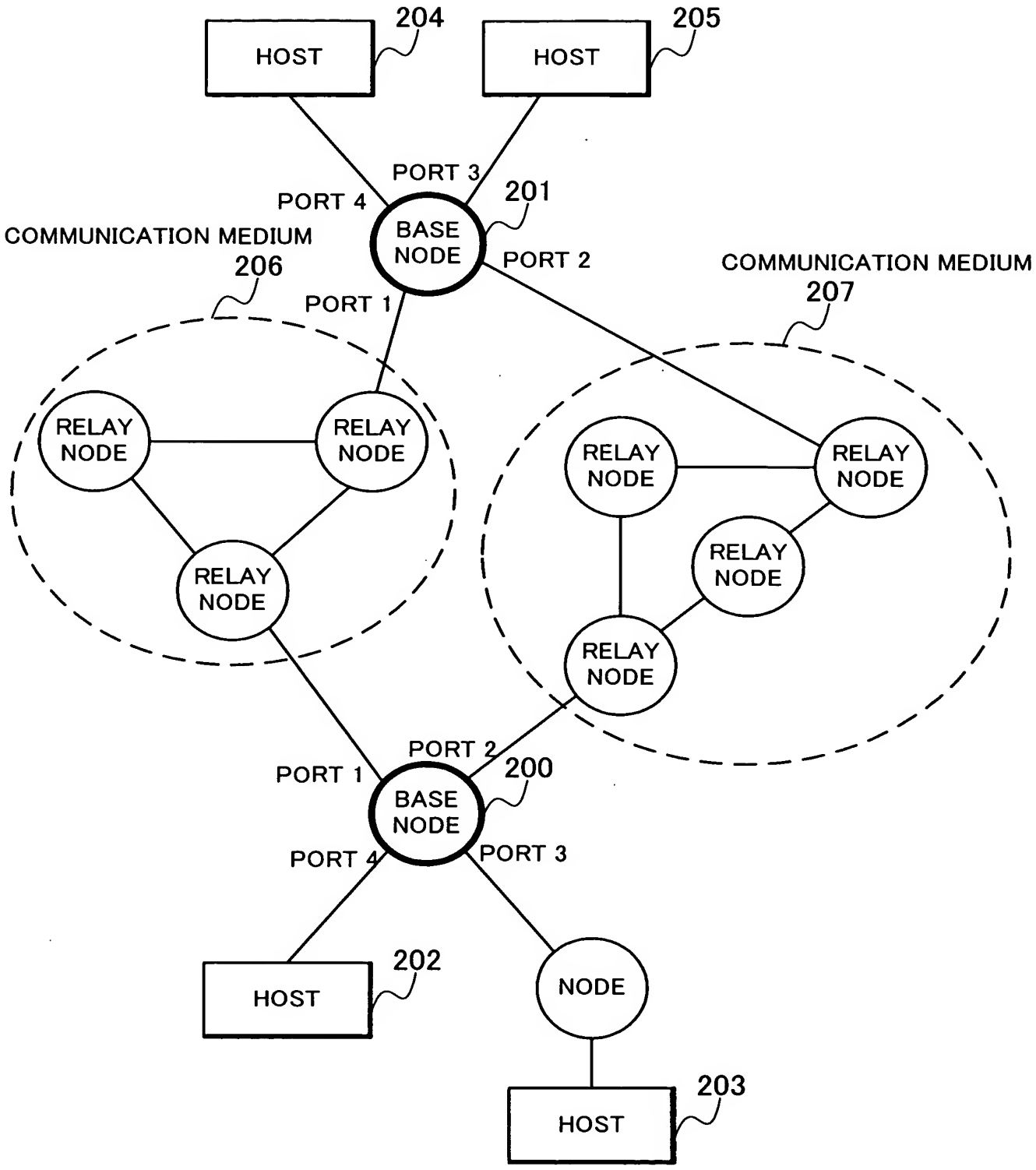

HOST
204
HOST
205
PORT 3
PORT 4
201
BASE NODE
PORT 2
COMMUNICATION MEDIUM
206
PORT 1
COMMUNICATION MEDIUM
207
RELAY NODE
RELAY NODE
RELAY NODE
RELAY NODE
RELAY NODE
RELAY NODE
PORT 2
PORT 1
200
BASE NODE
PORT 4
PORT 3
HOST
202
NODE
HOST
203

FIG. 3

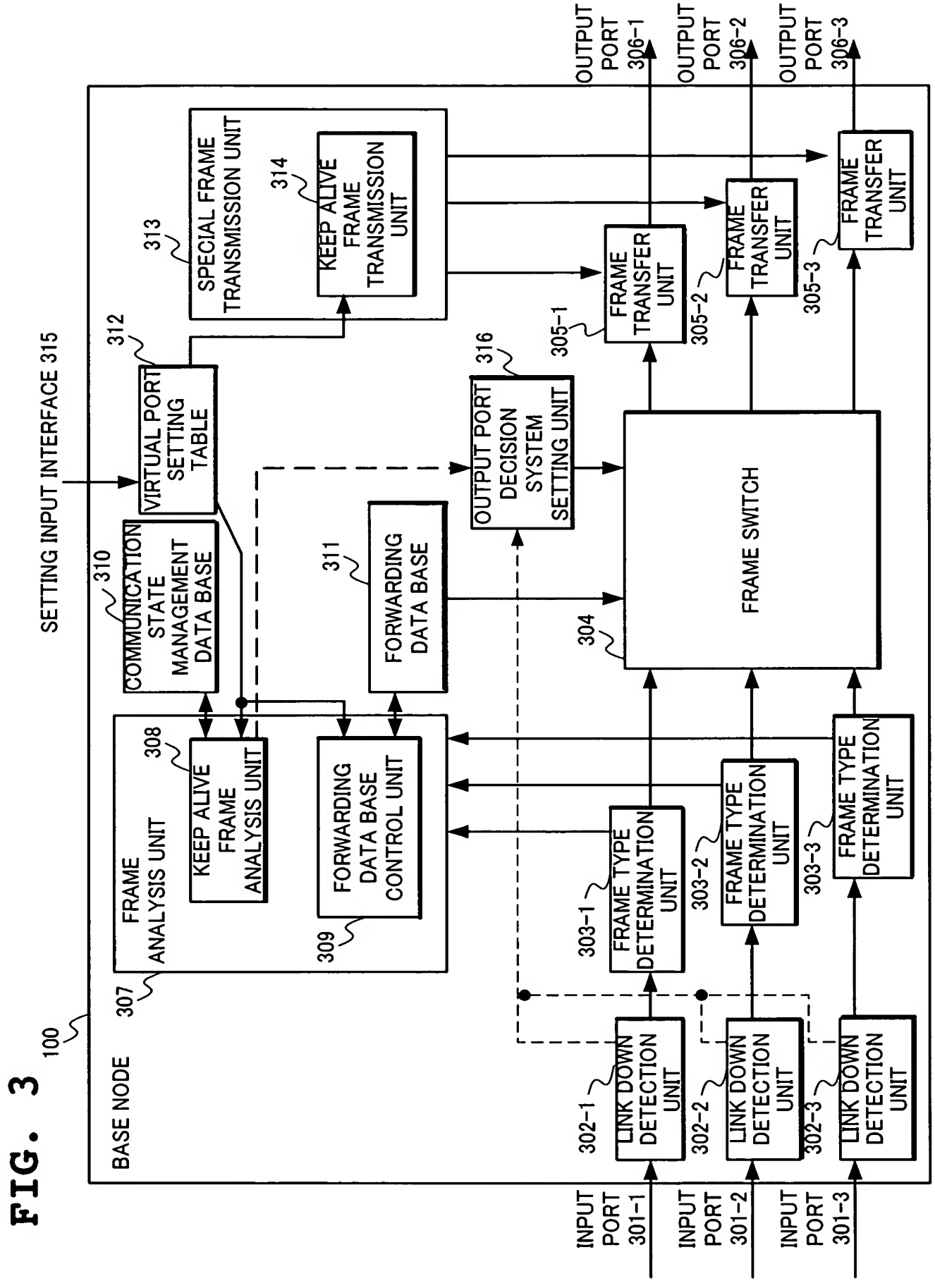

BASE NODE
100
SETTING INPUT INTERFACE 315
INPUT PORT 301-1
INPUT PORT 301-2
INPUT PORT 301-3
OUTPUT PORT 306-1
OUTPUT PORT 306-2
OUTPUT PORT 306-3
LINK DOWN DETECTION UNIT 302-1
LINK DOWN DETECTION UNIT 302-2
LINK DOWN DETECTION UNIT 302-3
FRAME TYPE DETERMINATION UNIT 303-1
FRAME TYPE DETERMINATION UNIT 303-2
FRAME TYPE DETERMINATION UNIT 303-3
FRAME SWITCH 304
FRAME TRANSFER UNIT 305-1
FRAME TRANSFER UNIT 305-2
FRAME TRANSFER UNIT 305-3
FRAME ANALYSIS UNIT 307
KEEP ALIVE FRAME ANALYSIS UNIT 308
FORWARDING DATA BASE CONTROL UNIT 309
COMMUNICATION STATE MANAGEMENT DATA BASE 310
FORWARDING DATA BASE 311
VIRTUAL PORT SETTING TABLE 312
SPECIAL FRAME TRANSMISSION UNIT 313
KEEP ALIVE FRAME TRANSMISSION UNIT 314
OUTPUT PORT DECISION SYSTEM SETTING UNIT 316

FIG. 4

312 VIRTUAL PORT SETTING TABLE

VIRTUAL PORT	PORT 1, PORT 2

FIG. 5

311 FORWARDING DATA BASE

DESTINATION NODE INFORMATION	OUTPUT PORT 1	OUTPUT PORT 2
MAC ADDRESS OF BASE NODE 101	PORT 1	PORT 2
MAC ADDRESS OF HOST 104	PORT 3	PORT 3
MAC ADDRESS OF HOST 105	PORT 1	PORT 2
BROADCAST MAC ADDRESS	PORT1、PORT 3	PORT 2、PORT 3
MULTICAST MAC ADDRESS	PORT 1、PORT 3	PORT 2、PORT 3

FIG. 6

310 COMMUNICATION STATE MANAGEMENT DATA BASE

TRANSMISSION SOURCE NODE INFORMATION	PORT 1	PORT 2
MAC ADDRESS OF BASE NODE 101	RECEIVED STATE	YET-TO-ARRIVE STATE

FIG. 7

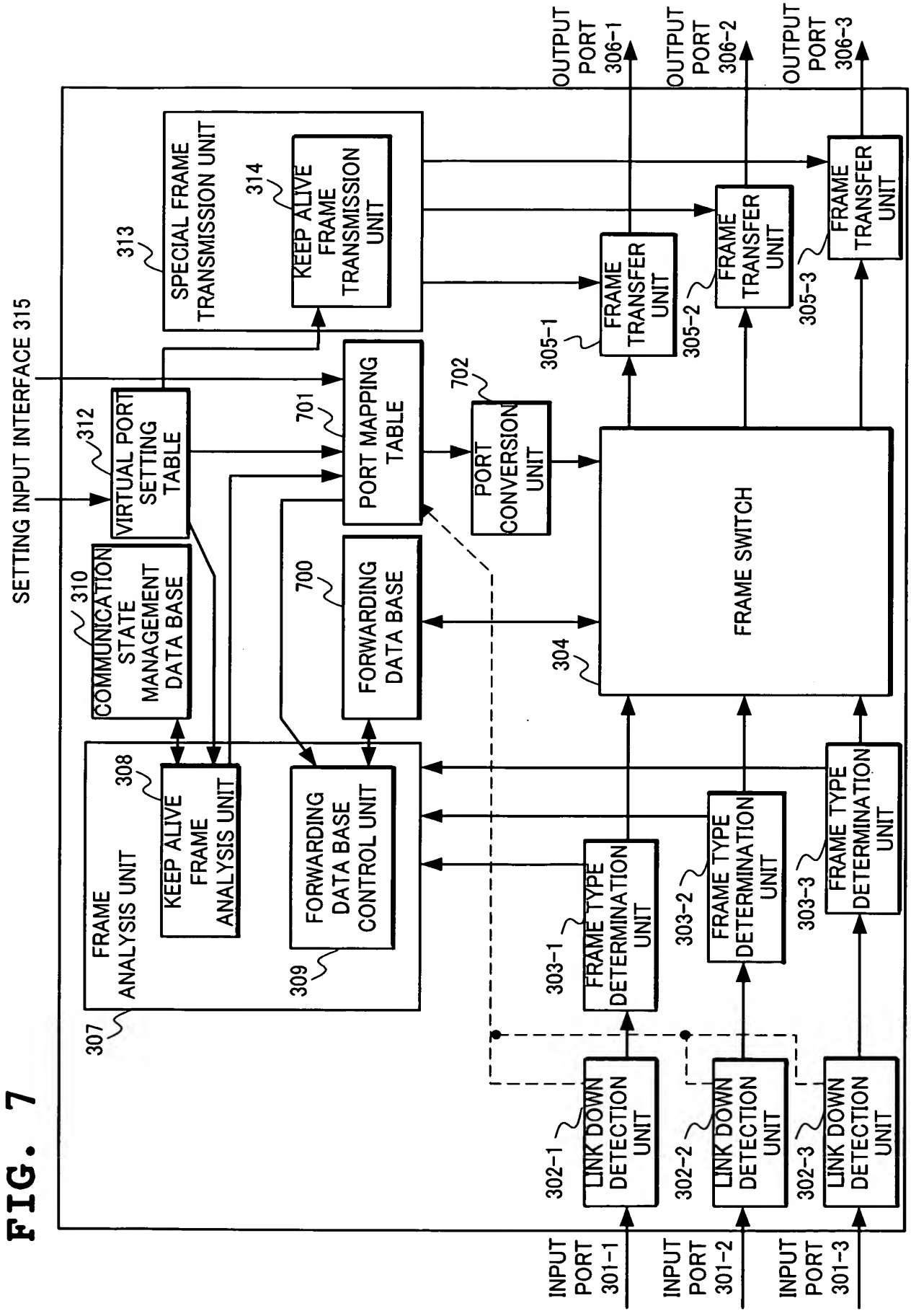

SETTING INPUT INTERFACE 315
SPECIAL FRAME TRANSMISSION UNIT
313
KEEP ALIVE FRAME TRANSMISSION UNIT
314
VIRTUAL PORT SETTING TABLE
312
PORT MAPPING TABLE
701
PORT CONVERSION UNIT
702
COMMUNICATION STATE MANAGEMENT DATA BASE
310
FORWARDING DATA BASE
700
FRAME SWITCH
304
FRAME ANALYSIS UNIT
307
KEEP ALIVE FRAME ANALYSIS UNIT
308
FORWARDING DATA BASE CONTROL UNIT
309
FRAME TRANSFER UNIT
305-1
305-2
305-3
FRAME TYPE DETERMINATION UNIT
303-1
303-2
303-3
LINK DOWN DETECTION UNIT
302-1
302-2
302-3
INPUT PORT 301-1
INPUT PORT 301-2
INPUT PORT 301-3
OUTPUT PORT 306-1
OUTPUT PORT 306-2
OUTPUT PORT 306-3

FIG. 8

701 PORT MAPPING TABLE

VIRTUAL PORT	REAL PORT
PORT 11	PORT 1、PORT 2

FIG. 9

700 FORWARDING DATA BASE

DESTINATION NODE INFORMATION	OUTPUT PORT
MAC ADDRESS OF BASE NODE 101	PORT 11
MAC ADDRESS OF HOST 104	PORT 3
MAC ADDRESS OF HOST 105	PORT 11
BROADCAST MAC ADDRESS	PORT 3、PORT 11
MULTICAST MAC ADDRESS	PORT 3、PORT 11

FIG. 10

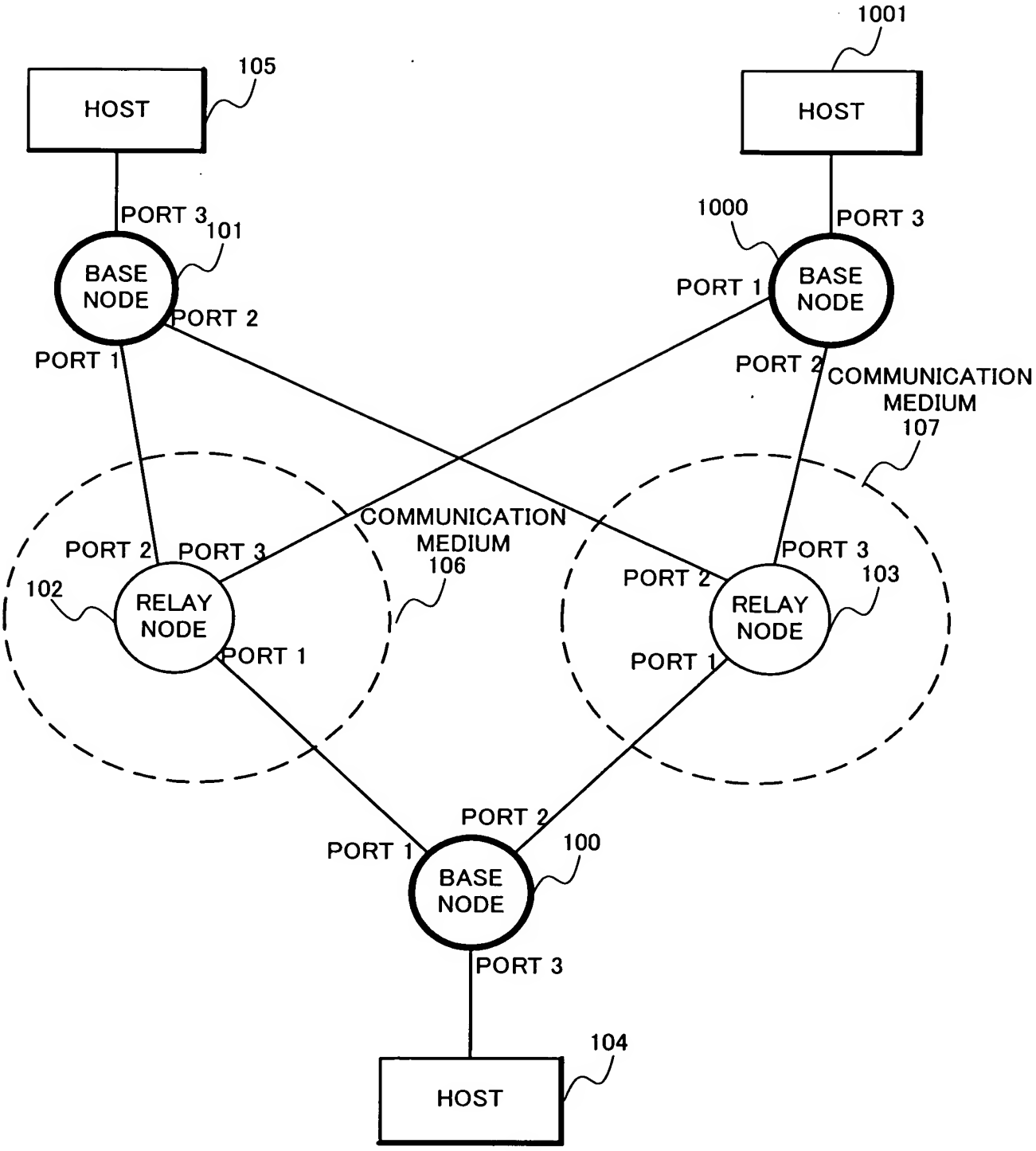
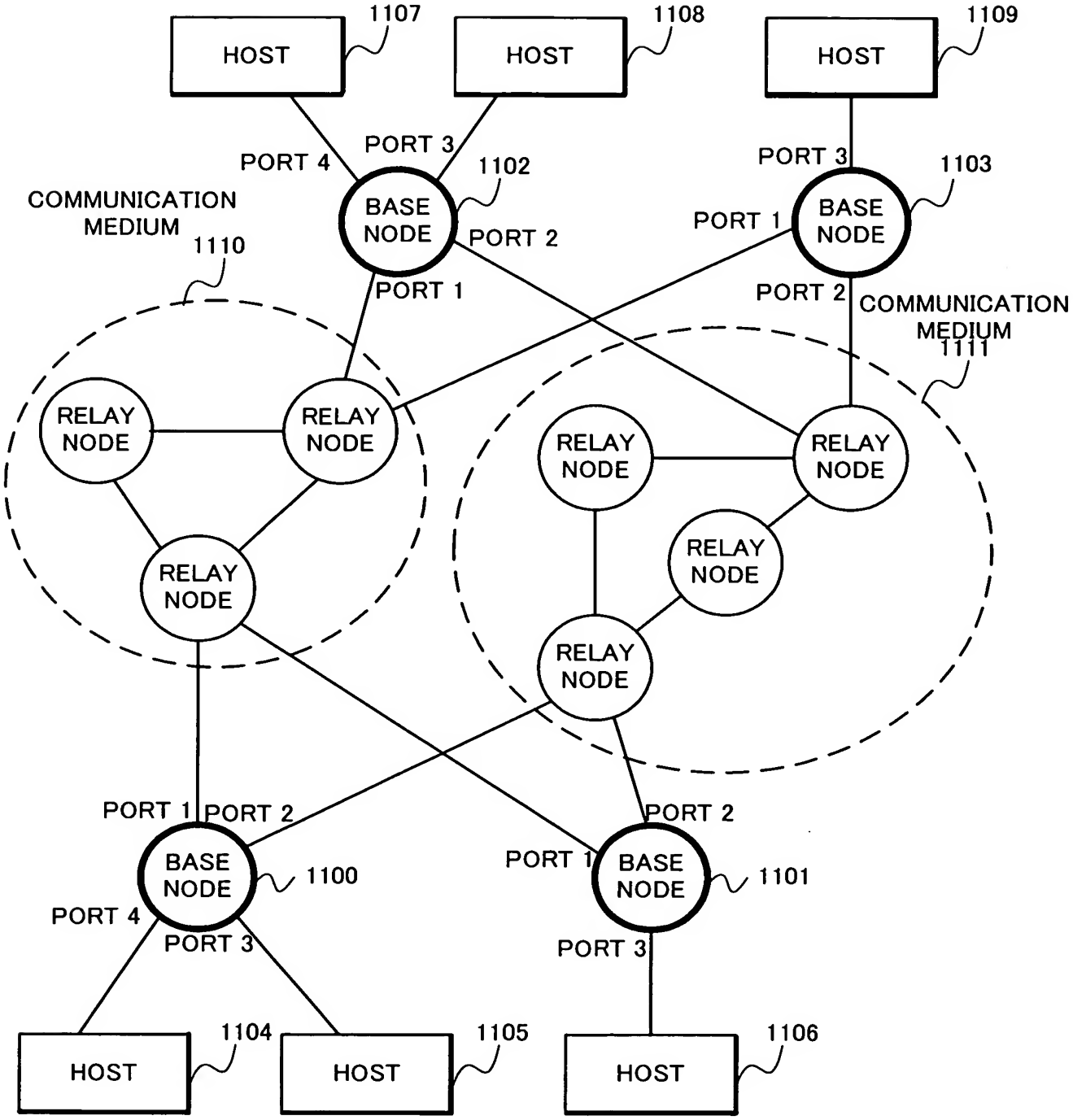

1001
105
HOST
HOST
PORT 3
101
1000
PORT 3
BASE NODE
PORT 1
BASE NODE
PORT 2
PORT 1
PORT 2
COMMUNICATION MEDIUM
107
COMMUNICATION MEDIUM
106
PORT 2
PORT 3
PORT 3
102
RELAY NODE
PORT 2
103
RELAY NODE
PORT 1
PORT 1
PORT 2
PORT 1
100
BASE NODE
PORT 3
104
HOST

FIG. 11



312

COMMUNICATION STATE MANAGEMENT DATA BASE OF BASE NODE 1100

TRANSMISSION SOURCE NODE INFORMATION	PORT 1	PORT 2
MAC ADDRESS OF BASE NODE 1101	RECEIVED STATE	YET-TO-ARRIVE STATE
MAC ADDRESS OF BASE NODE 1102	YET-TO-ARRIVE STATE	RECEIVED STATE
MAC ADDRESS OF BASE NODE 1103	RECEIVED STATE	YET-TO-ARRIVE STATE

FIG. 12

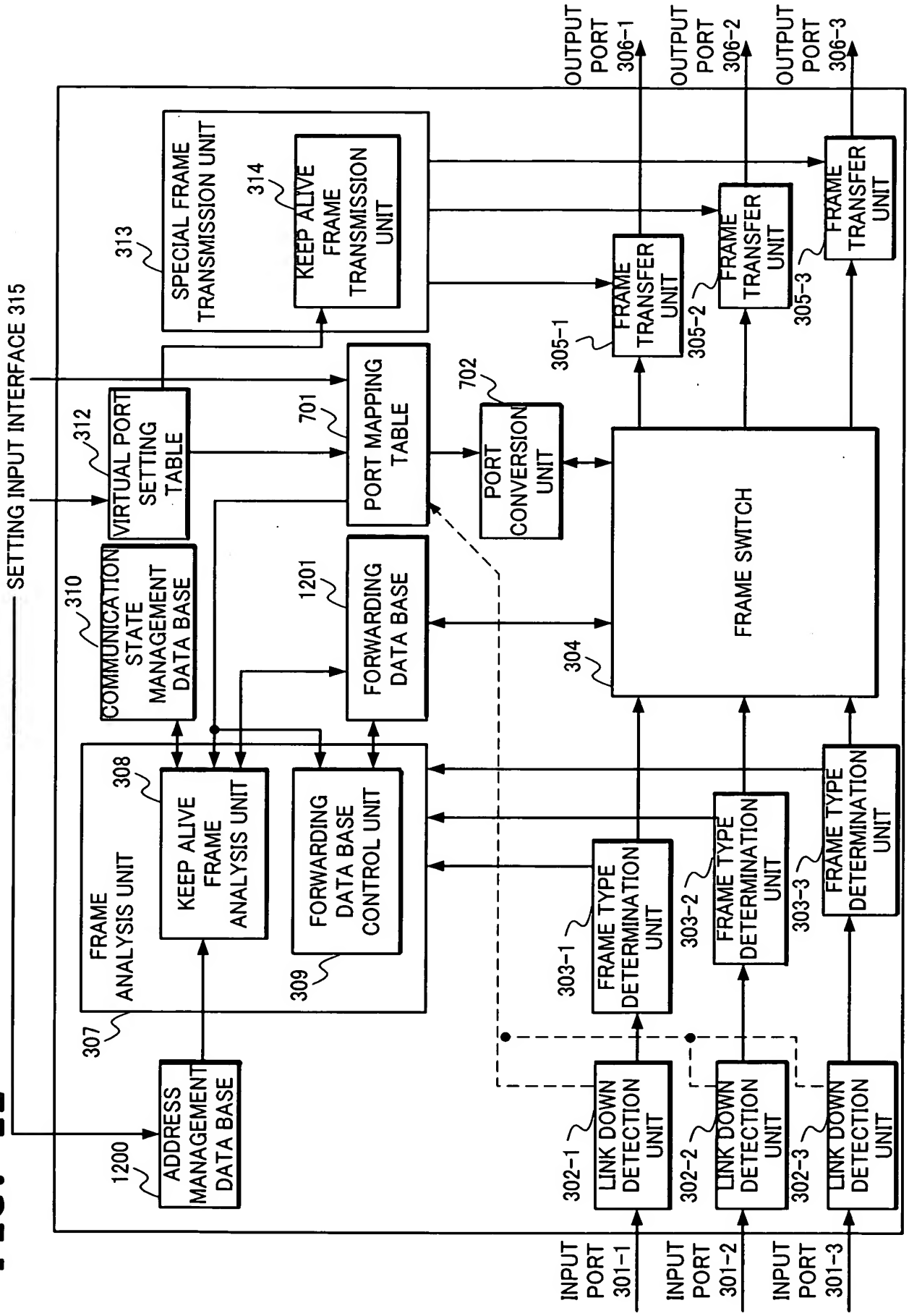

SETTING INPUT INTERFACE 315
1200
ADDRESS MANAGEMENT DATA BASE
307
FRAME ANALYSIS UNIT
308
KEEP ALIVE FRAME ANALYSIS UNIT
309
FORWARDING DATA BASE CONTROL UNIT
310
COMMUNICATION STATE MANAGEMENT DATA BASE
312
VIRTUAL PORT SETTING TABLE
313
SPECIAL FRAME TRANSMISSION UNIT
314
KEEP ALIVE FRAME TRANSMISSION UNIT
1201
FORWARDING DATA BASE
701
PORT MAPPING TABLE
702
PORT CONVERSION UNIT
304
FRAME SWITCH
302-1
LINK DOWN DETECTION UNIT
302-2
LINK DOWN DETECTION UNIT
302-3
LINK DOWN DETECTION UNIT
303-1
FRAME TYPE DETERMINATION UNIT
303-2
FRAME TYPE DETERMINATION UNIT
303-3
FRAME TYPE DETERMINATION UNIT
305-1
FRAME TRANSFER UNIT
305-2
FRAME TRANSFER UNIT
305-3
FRAME TRANSFER UNIT
INPUT PORT 301-1
INPUT PORT 301-2
INPUT PORT 301-3
OUTPUT PORT 306-1
OUTPUT PORT 306-2
OUTPUT PORT 306-3

FIG. 13

1200 ADDRESS MANAGEMENT DATA BASE

PARTNER NODE INFORMATION	NODE IDENTIFIER OF HOST
MAC ADDRESS OF BASE NODE 101	MAC ADDRESS OF HOST 105
MAC ADDRESS OF BASE NODE 1000	MAC ADDRESS OF HOST 1001

FIG. 14

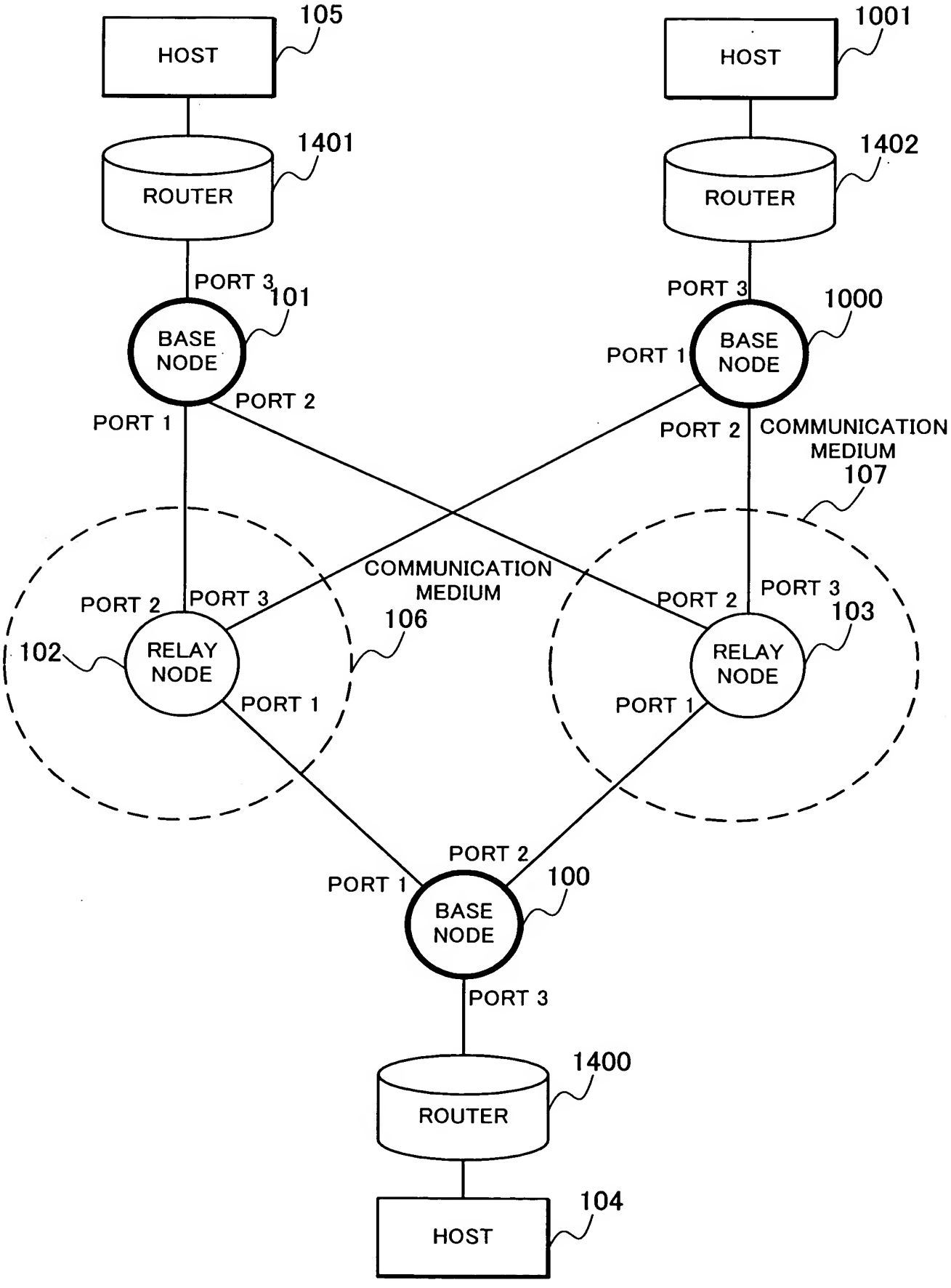

HOST
105
HOST
1001
ROUTER
1401
ROUTER
1402
PORT 3
PORT 3
101
1000
BASE NODE
PORT 1
BASE NODE
PORT 2
PORT 1
PORT 2
COMMUNICATION MEDIUM
107
COMMUNICATION MEDIUM
106
PORT 2
PORT 3
PORT 2
PORT 3
103
102
RELAY NODE
RELAY NODE
PORT 1
PORT 1
PORT 2
PORT 1
100
BASE NODE
PORT 3
1400
ROUTER
HOST
104

FIG. 15

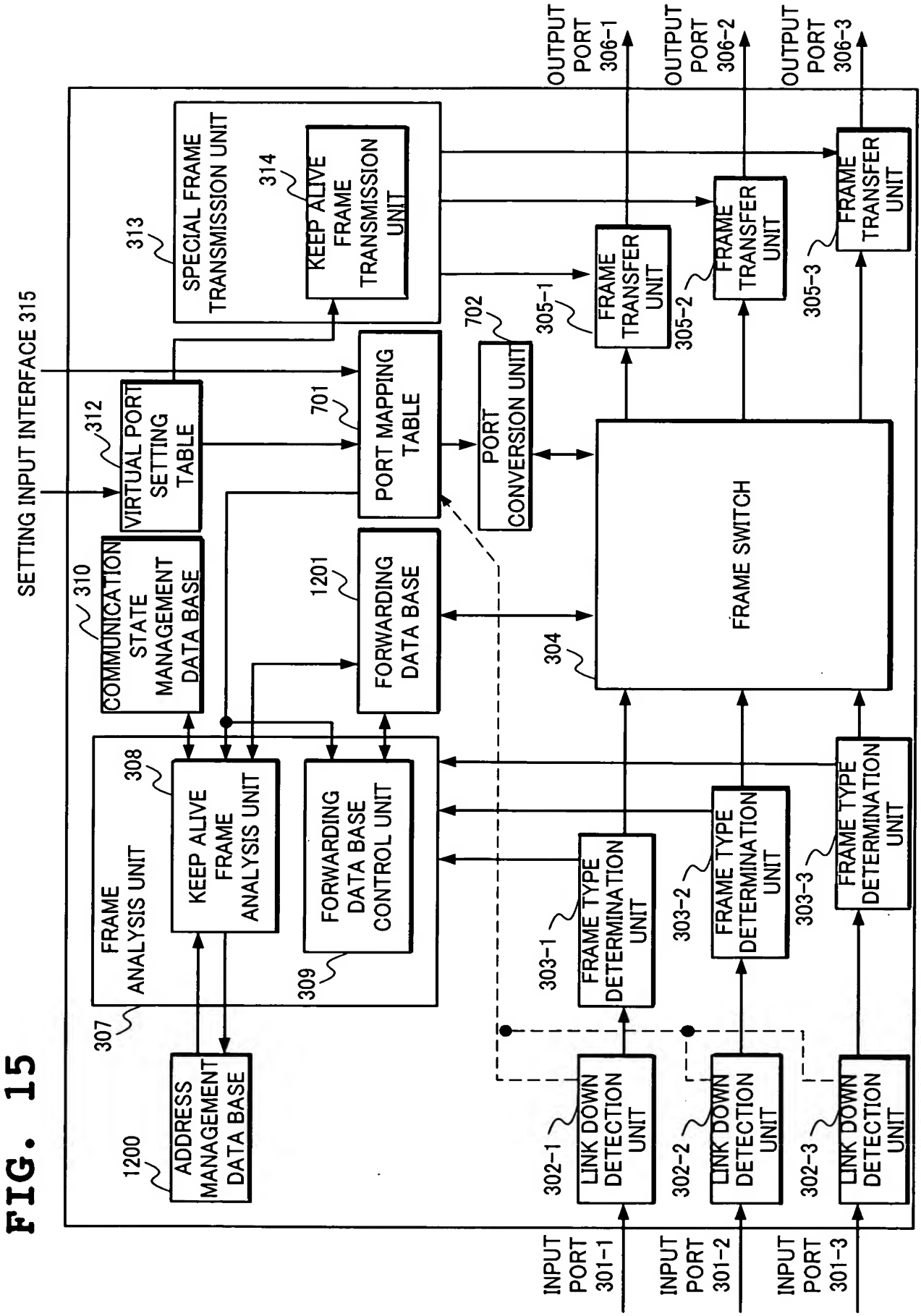

SETTING INPUT INTERFACE 315
SPECIAL FRAME TRANSMISSION UNIT
313
KEEP ALIVE FRAME TRANSMISSION UNIT
314
VIRTUAL PORT SETTING TABLE
312
PORT MAPPING TABLE
701
PORT CONVERSION UNIT
702
FRAME TRANSFER UNIT
305-1
FRAME TRANSFER UNIT
305-2
FRAME TRANSFER UNIT
305-3
OUTPUT PORT 306-1
OUTPUT PORT 306-2
OUTPUT PORT 306-3
COMMUNICATION STATE MANAGEMENT DATA BASE
310
FORWARDING DATA BASE
1201
FRAME SWITCH
304
FRAME ANALYSIS UNIT
308
KEEP ALIVE FRAME ANALYSIS UNIT
FORWARDING DATA BASE CONTROL UNIT
309
307
ADDRESS MANAGEMENT DATA BASE
1200
FRAME TYPE DETERMINATION UNIT
303-1
FRAME TYPE DETERMINATION UNIT
303-2
FRAME TYPE DETERMINATION UNIT
303-3
LINK DOWN DETECTION UNIT
302-1
LINK DOWN DETECTION UNIT
302-2
LINK DOWN DETECTION UNIT
302-3
INPUT PORT 301-1
INPUT PORT 301-2
INPUT PORT 301-3

FIG. 16

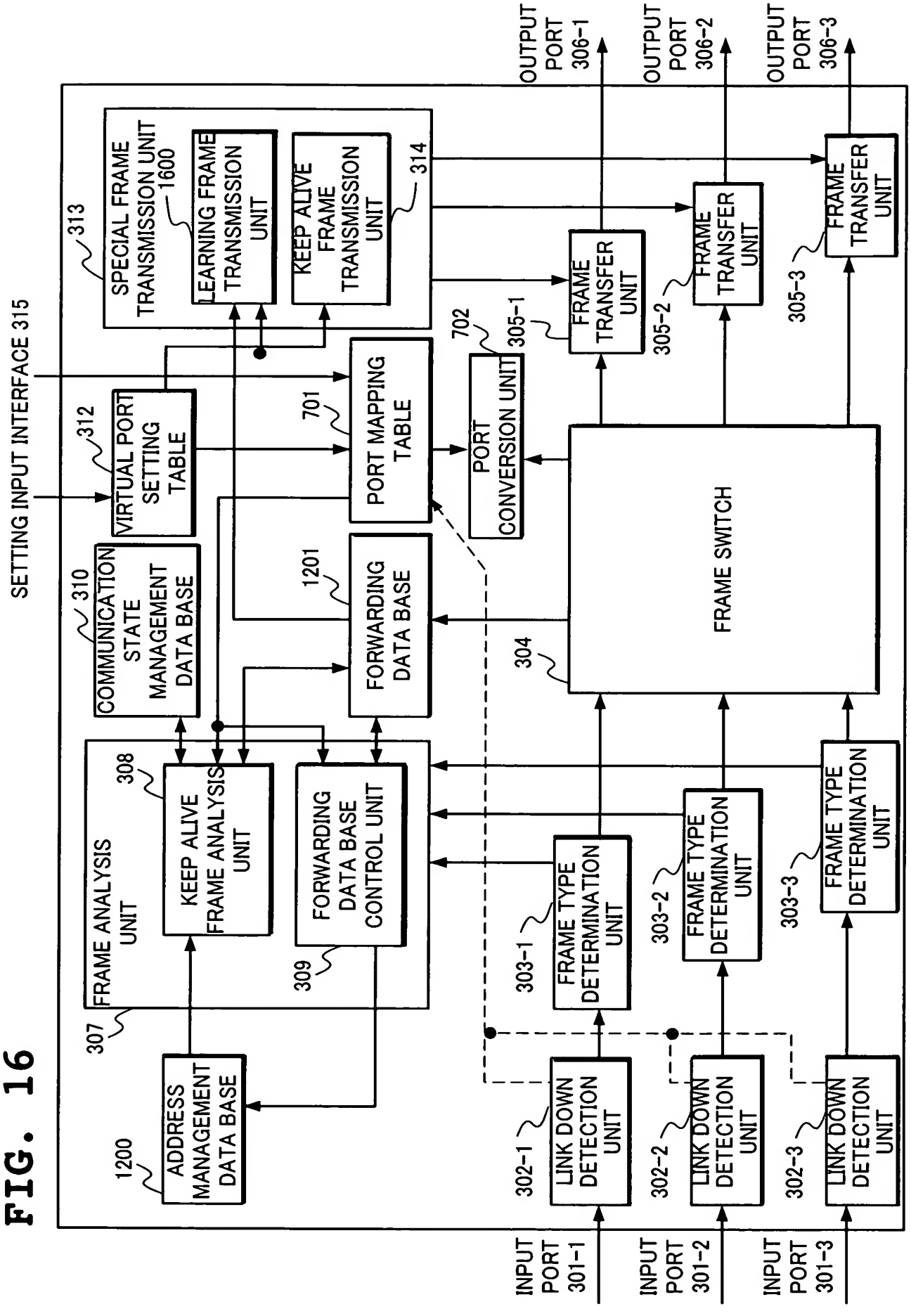

SETTING INPUT INTERFACE 315
SPECIAL FRAME TRANSMISSION UNIT 1600
313
LEARNING FRAME TRANSMISSION UNIT
KEEP ALIVE FRAME TRANSMISSION UNIT
314
VIRTUAL PORT SETTING TABLE
312
PORT MAPPING TABLE
701
PORT CONVERSION UNIT
702
COMMUNICATION STATE MANAGEMENT DATA BASE
310
FORWARDING DATA BASE
1201
FRAME SWITCH
304
FRAME TRANSFER UNIT
305-1
305-2
305-3
FRAME ANALYSIS UNIT
307
KEEP ALIVE FRAME ANALYSIS UNIT
308
FORWARDING DATA BASE CONTROL UNIT
309
ADDRESS MANAGEMENT DATA BASE
1200
FRAME TYPE DETERMINATION UNIT
303-1
303-2
303-3
LINK DOWN DETECTION UNIT
302-1
302-2
302-3
INPUT PORT 301-1
INPUT PORT 301-2
INPUT PORT 301-3
OUTPUT PORT 306-1
OUTPUT PORT 306-2
OUTPUT PORT 306-3

FIG. 17

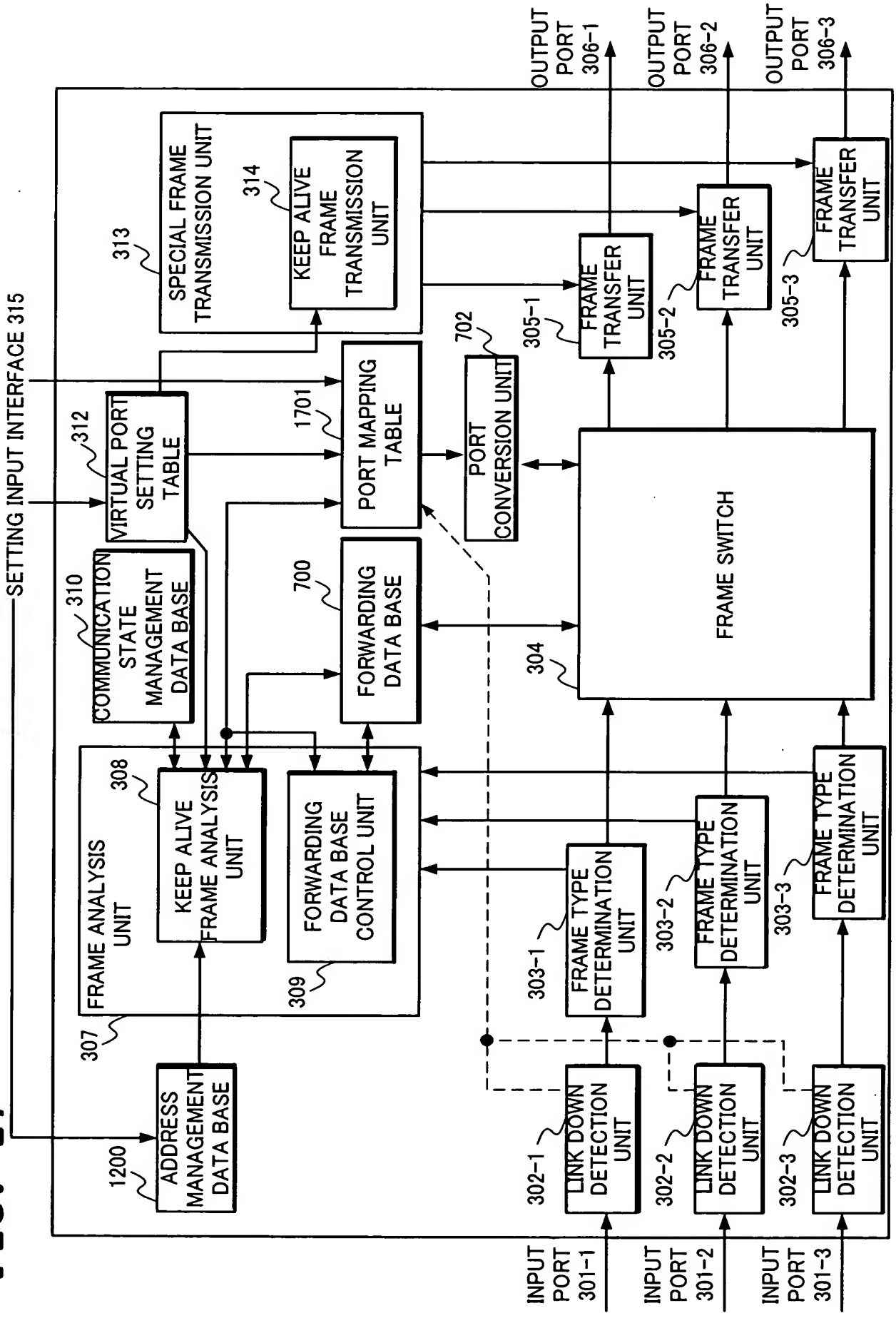

SETTING INPUT INTERFACE 315
SPECIAL FRAME TRANSMISSION UNIT
313
KEEP ALIVE FRAME TRANSMISSION UNIT
314
VIRTUAL PORT SETTING TABLE
312
PORT MAPPING TABLE
1701
PORT CONVERSION UNIT
702
COMMUNICATION STATE MANAGEMENT DATA BASE
310
FORWARDING DATA BASE
700
FRAME SWITCH
304
FRAME ANALYSIS UNIT
307
KEEP ALIVE FRAME ANALYSIS UNIT
308
FORWARDING DATA BASE CONTROL UNIT
309
ADDRESS MANAGEMENT DATA BASE
1200
FRAME TYPE DETERMINATION UNIT
303-1
303-2
303-3
LINK DOWN DETECTION UNIT
302-1
302-2
302-3
FRAME TRANSFER UNIT
305-1
305-2
305-3
INPUT PORT 301-1
INPUT PORT 301-2
INPUT PORT 301-3
OUTPUT PORT 306-1
OUTPUT PORT 306-2
OUTPUT PORT 306-3

FIG. 18

1701 PORT MAPPING TABLE

PARTNER NODE INFORMATION	VIRTUAL PORT	REAL PORT
MAC ADDRESS OF BASE NODE 101	PORT 11	PORT 1、PORT 2
MAC ADDRESS OF BASE NODE 1000	PORT 12	PORT 1、PORT 2
BROADCAST MAC ADDRESS	PORT 21	PORT 1、PORT 2

FIG. 19

700 FORWARDING DATA BASE

DESTINATION NODE INFORMATION	OUTPUT PORT
MAC ADDRESS OF BASE NODE 1001	PORT 11
MAC ADDRESS OF BASE NODE 1002	PORT 12
MAC ADDRESS OF HOST 1005	PORT 3
MAC ADDRESS OF HOST 1006	PORT 11
MAC ADDRESS OF HOST 1007	PORT 12
BROADCAST MAC ADDRESS	PORT 3, PORT 21
MULTICAST MAC ADDRESS	PORT 3, PORT 21

FIG. 20

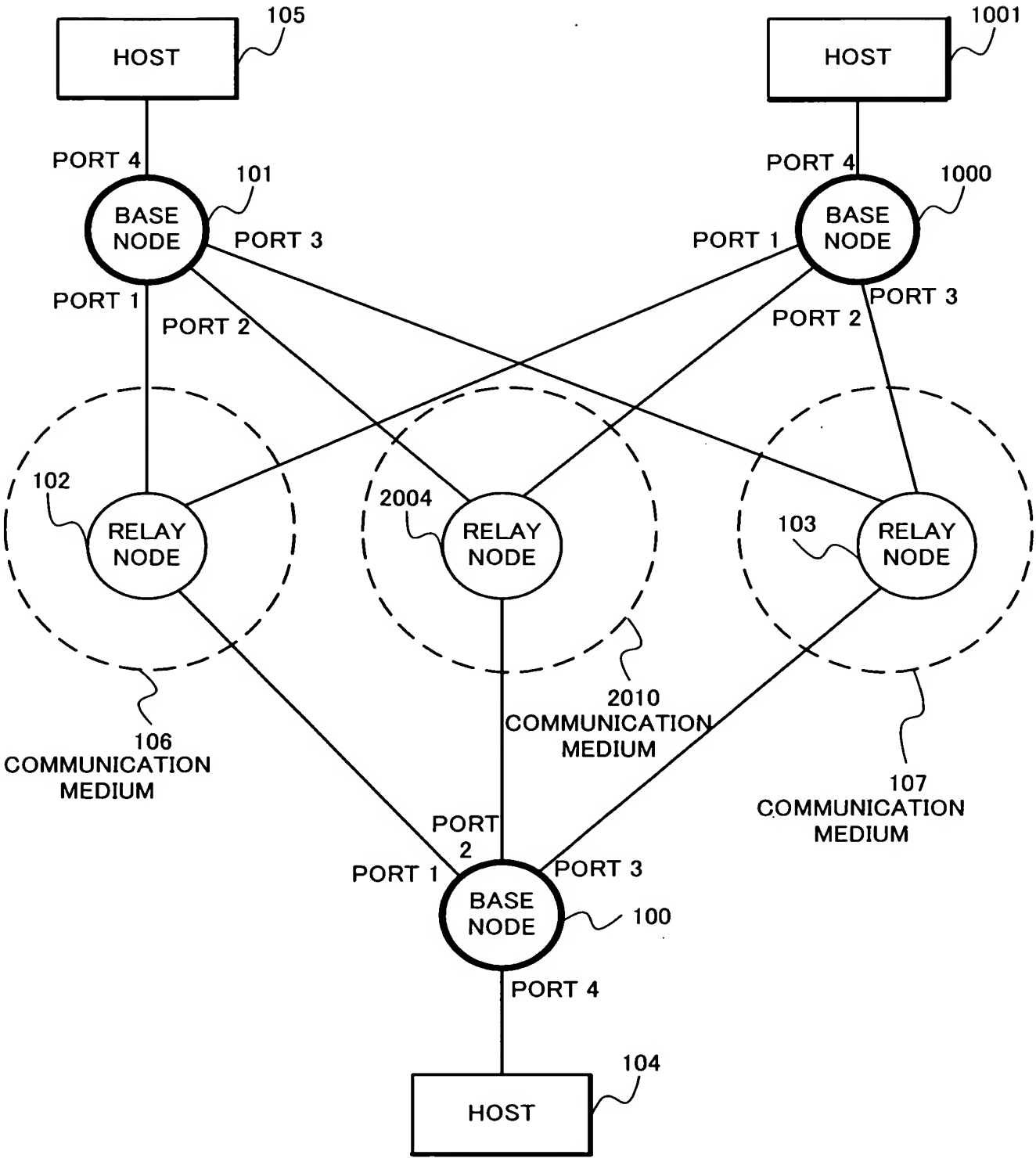

HOST
105
HOST
1001
PORT 4
101
BASE NODE
PORT 3
PORT 1
PORT 2
PORT 4
1000
BASE NODE
PORT 1
PORT 3
PORT 2
102
RELAY NODE
2004
RELAY NODE
103
RELAY NODE
106
COMMUNICATION MEDIUM
2010
COMMUNICATION MEDIUM
107
COMMUNICATION MEDIUM
PORT 2
PORT 1
PORT 3
BASE NODE
100
PORT 4
HOST
104

FIG. 21

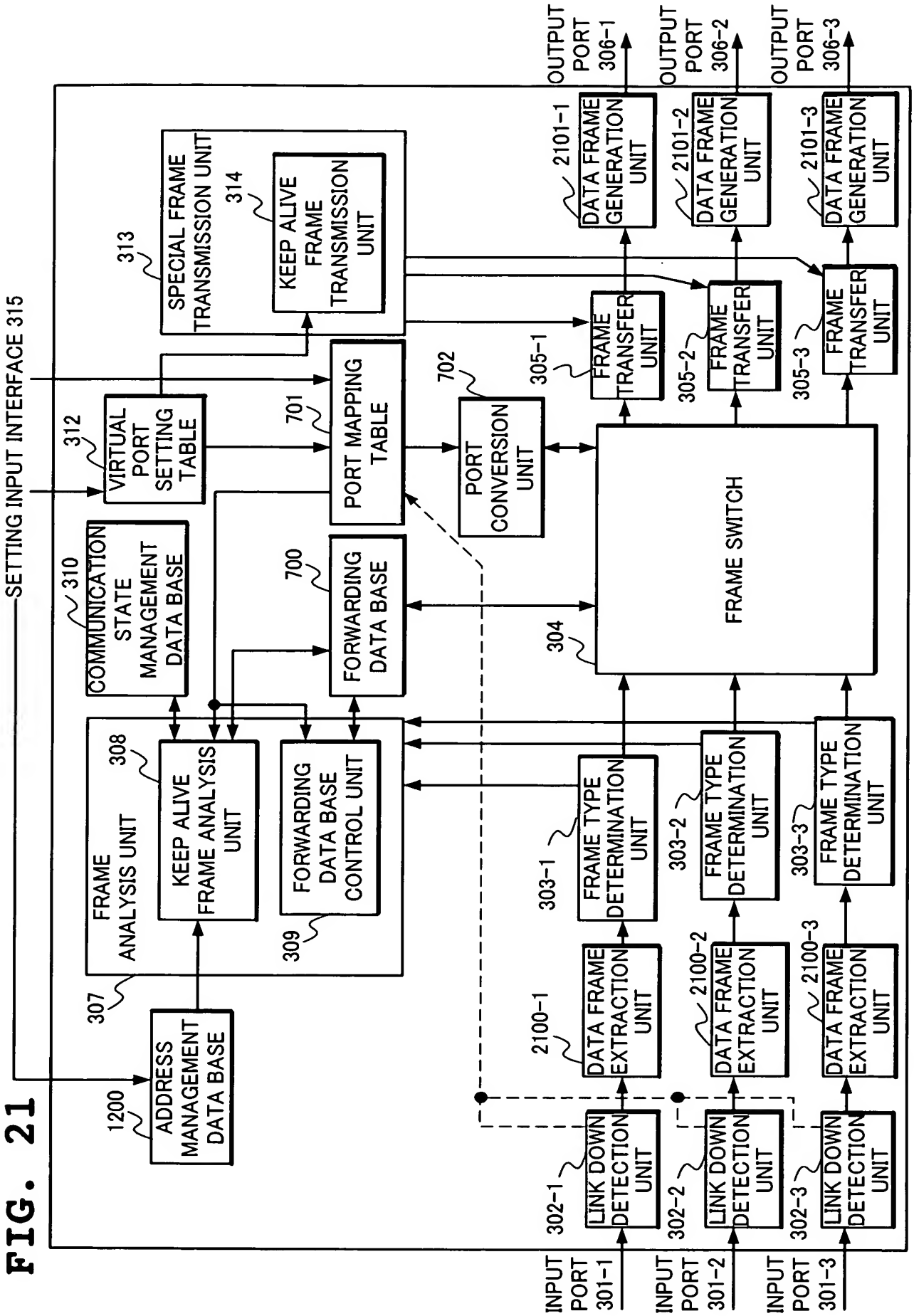

SETTING INPUT INTERFACE 315
INPUT PORT 301-1
INPUT PORT 301-2
INPUT PORT 301-3
OUTPUT PORT 306-1
OUTPUT PORT 306-2
OUTPUT PORT 306-3
LINK DOWN DETECTION UNIT 302-1
LINK DOWN DETECTION UNIT 302-2
LINK DOWN DETECTION UNIT 302-3
DATA FRAME EXTRACTION UNIT 2100-1
DATA FRAME EXTRACTION UNIT 2100-2
DATA FRAME EXTRACTION UNIT 2100-3
FRAME TYPE DETERMINATION UNIT 303-1
FRAME TYPE DETERMINATION UNIT 303-2
FRAME TYPE DETERMINATION UNIT 303-3
FRAME SWITCH 304
FRAME TRANSFER UNIT 305-1
FRAME TRANSFER UNIT 305-2
FRAME TRANSFER UNIT 305-3
DATA FRAME GENERATION UNIT 2101-1
DATA FRAME GENERATION UNIT 2101-2
DATA FRAME GENERATION UNIT 2101-3
FRAME ANALYSIS UNIT 307
KEEP ALIVE FRAME ANALYSIS UNIT 308
FORWARDING DATA BASE CONTROL UNIT 309
COMMUNICATION STATE MANAGEMENT DATA BASE 310
VIRTUAL PORT SETTING TABLE 312
SPECIAL FRAME TRANSMISSION UNIT 313
KEEP ALIVE FRAME TRANSMISSION UNIT 314
ADDRESS MANAGEMENT DATA BASE 1200
FORWARDING DATA BASE 700
PORT MAPPING TABLE 701
PORT CONVERSION UNIT 702

FIG. 22

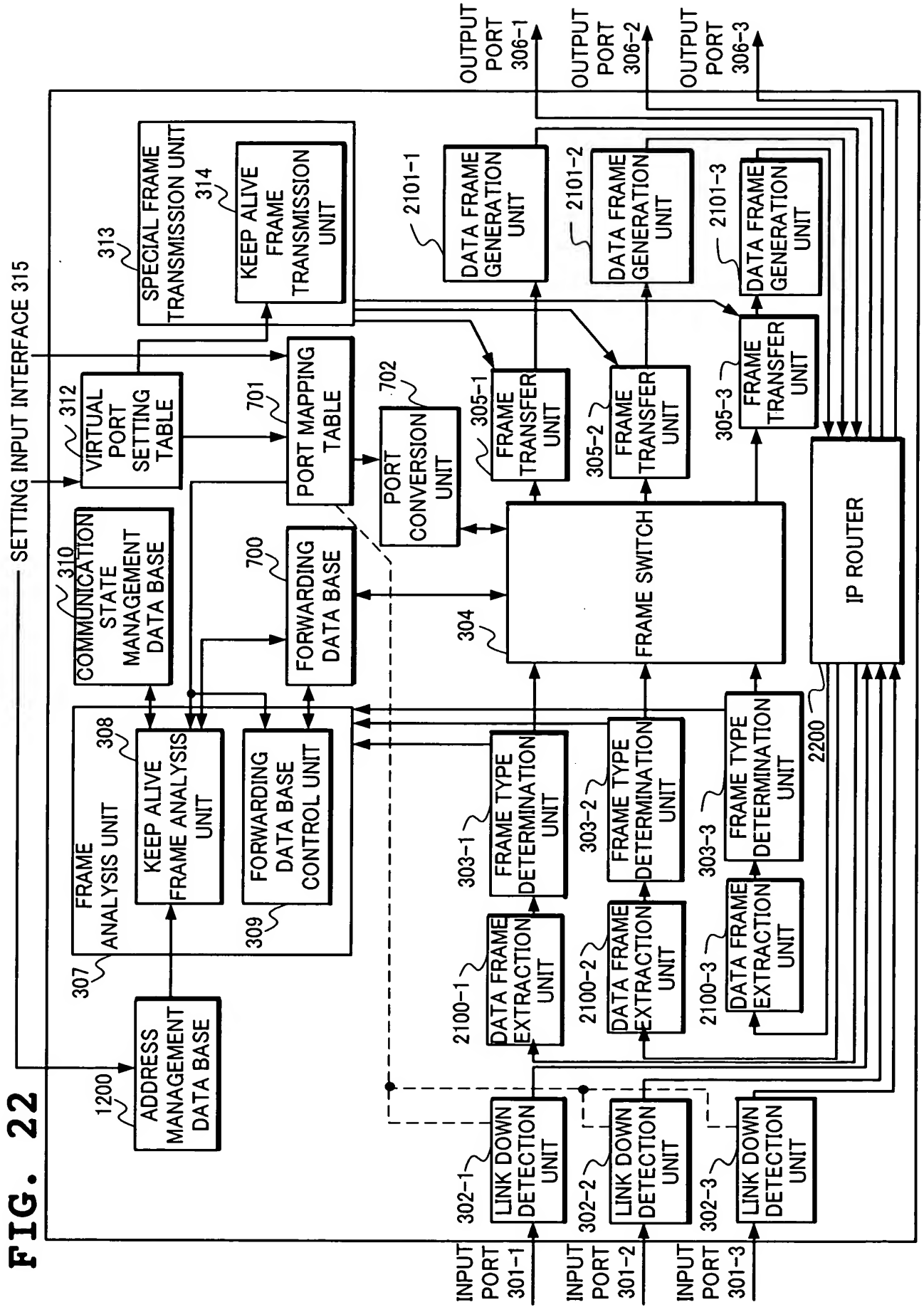

SETTING INPUT INTERFACE 315
INPUT PORT 301-1
INPUT PORT 301-2
INPUT PORT 301-3
OUTPUT PORT 306-1
OUTPUT PORT 306-2
OUTPUT PORT 306-3
LINK DOWN DETECTION UNIT 302-1
LINK DOWN DETECTION UNIT 302-2
LINK DOWN DETECTION UNIT 302-3
DATA FRAME EXTRACTION UNIT 2100-1
DATA FRAME EXTRACTION UNIT 2100-2
DATA FRAME EXTRACTION UNIT 2100-3
FRAME TYPE DETERMINATION UNIT 303-1
FRAME TYPE DETERMINATION UNIT 303-2
FRAME TYPE DETERMINATION UNIT 303-3
2200
IP ROUTER
FRAME SWITCH 304
FRAME TRANSFER UNIT 305-1
FRAME TRANSFER UNIT 305-2
FRAME TRANSFER UNIT 305-3
DATA FRAME GENERATION UNIT 2101-1
DATA FRAME GENERATION UNIT 2101-2
DATA FRAME GENERATION UNIT 2101-3
SPECIAL FRAME TRANSMISSION UNIT 313
KEEP ALIVE FRAME TRANSMISSION UNIT 314
PORT CONVERSION UNIT 702
PORT MAPPING TABLE 701
VIRTUAL PORT SETTING TABLE 312
FORWARDING DATA BASE 700
COMMUNICATION STATE MANAGEMENT DATA BASE 310
FRAME ANALYSIS UNIT 307
KEEP ALIVE FRAME ANALYSIS UNIT 308
FORWARDING DATA BASE CONTROL UNIT 309
ADDRESS MANAGEMENT DATA BASE 1200

FIG. 23

1201 FORWARDING DATA BASE

DESTINATION NODE INFORMATION	OUTPUT PORT
MAC ADDRESS OF BASE NODE 101	PORT 11
MAC ADDRESS OF BASE NODE 1000	PORT 11
MAC ADDRESS OF HOST 104	PORT 3
MAC ADDRESS OF HOST 105	PORT 11
MAC ADDRESS OF HOST 1001	PORT 11
BROADCAST MAC ADDRESS	PORT 3, PORT 11
MULTICAST MAC ADDRESS	PORT 3, PORT 11

FIG. 24

2400 COMMUNICATION STATE MANAGEMENT DATA BASE

TRANSMISSION SOURCE NODE INFORMATION	PORT 1	PORT 2
MAC ADDRESS OF BASE NODE 101	RECEIVED STATE	YET-TO-ARRIVE STATE
MAC ADDRESS OF BASE NODE 1000	YET-TO-ARRIVE STATE	RECEIVED STATE

FIG. 25

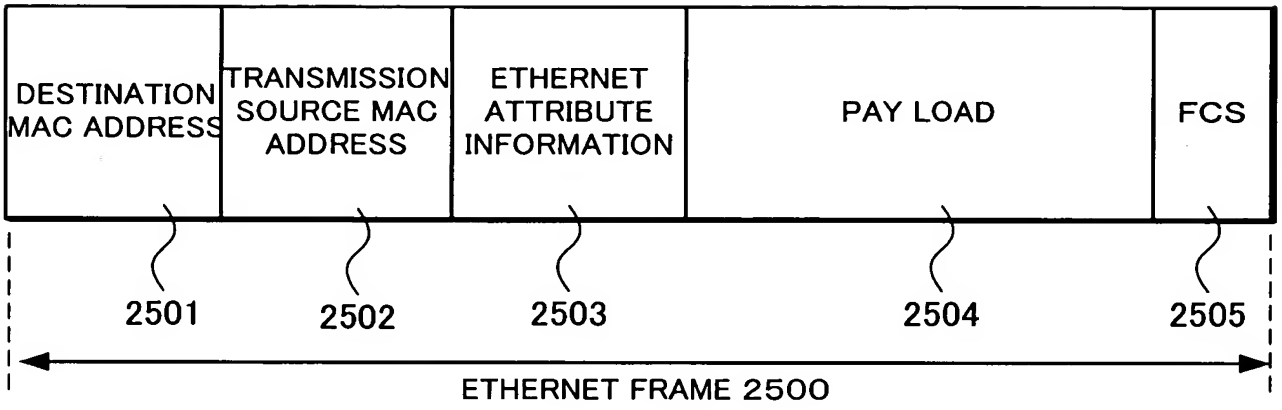

DESTINATION MAC ADDRESS
TRANSMISSION SOURCE MAC ADDRESS
ETHERNET ATTRIBUTE INFORMATION
PAY LOAD
FCS
2501
2502
2503
2504
2505
ETHERNET FRAME 2500

FIG. 26

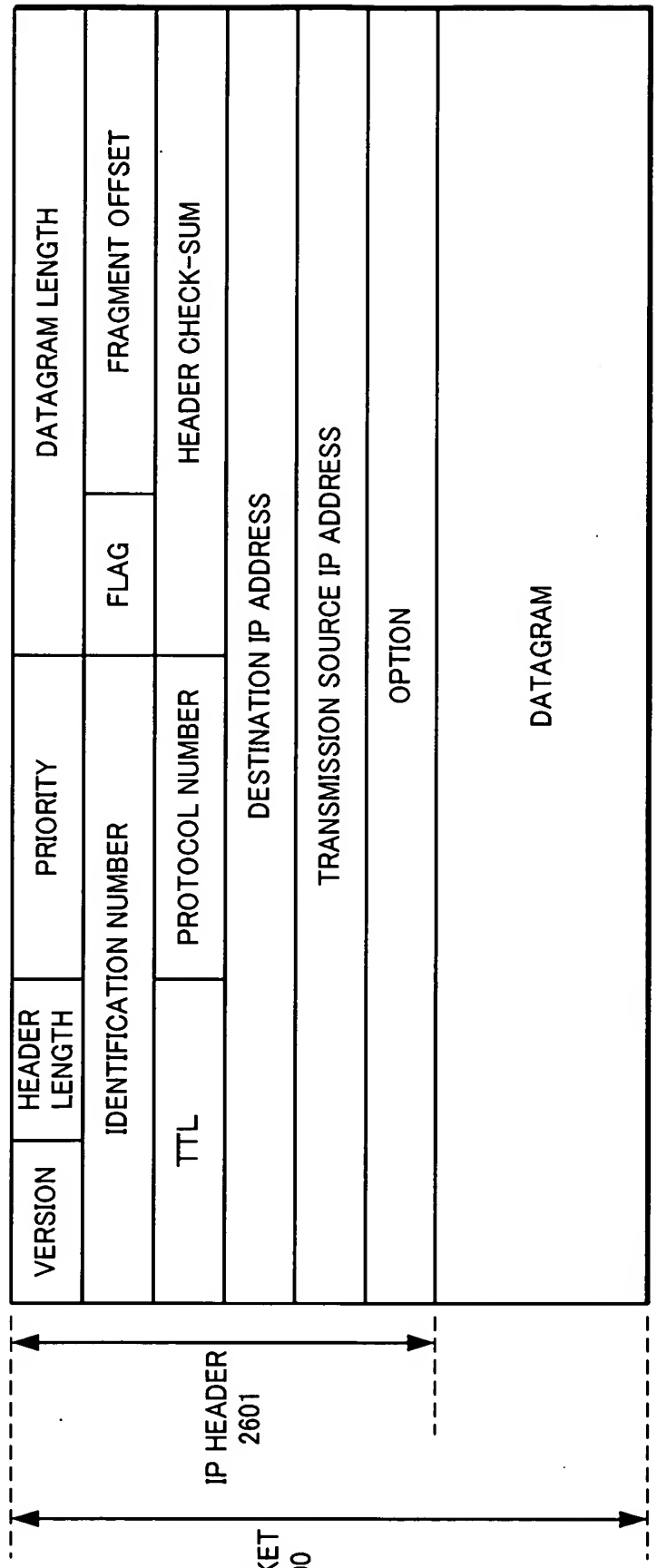

VERSION
HEADER LENGTH
PRIORITY
DATAGRAM LENGTH
IDENTIFICATION NUMBER
FLAG
FRAGMENT OFFSET
TTL
PROTOCOL NUMBER
HEADER CHECK-SUM
DESTINATION IP ADDRESS
TRANSMISSION SOURCE IP ADDRESS
OPTION
DATAGRAM
IP HEADER 2601
IP PACKET 2600

FIG. 27

700A FORWARDING DATA BASE

DESTINATION NODE INFORMATION	OUTPUT PORT	IP HEADER INFORMATION
MAC ADDRESS OF BASE NODE 101	PORT 11	IP ADDRESS OF BASE NODE 101
MAC ADDRESS OF BASE NODE 1000	PORT 11	IP ADDRESS OF BASE NODE 1000
MAC ADDRESS OF HOST 104	PORT 3	IP ADDRESS OF BASE NODE 100
MAC ADDRESS OF HOST 105	PORT 11	IP ADDRESS OF BASE NODE 101
MAC ADDRESS OF HOST 1001	PORT 11	IP ADDRESS OF BASE NODE 1000

FIG. 28

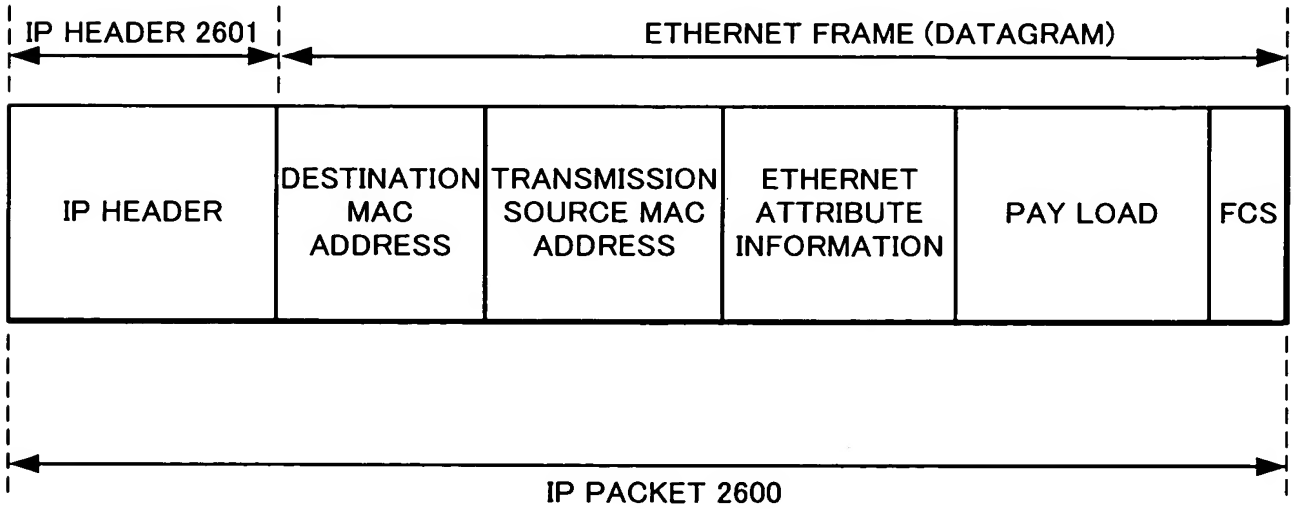


FIG. 29

1200 ADDRESS MANAGEMENT DATA BASE

PARTNER NODE INFORMATION	NODE IDENTIFIER OF ROUTER
MAC ADDRESS OF BASE NODE 101	MAC ADDRESS OF ROUTER 1401
MAC ADDRESS OF BASE NODE 1000	MAC ADDRESS OF ROUTER 1402

FIG. 30

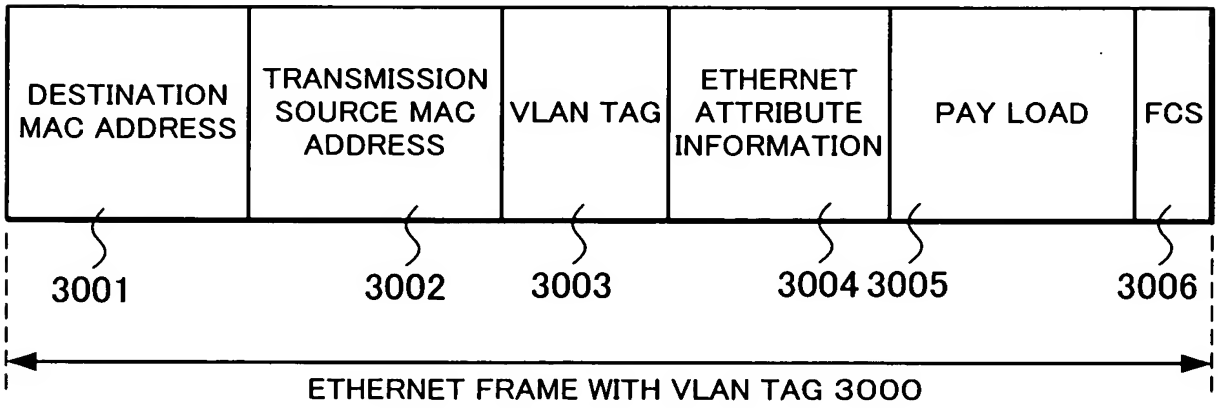


FIG. 31

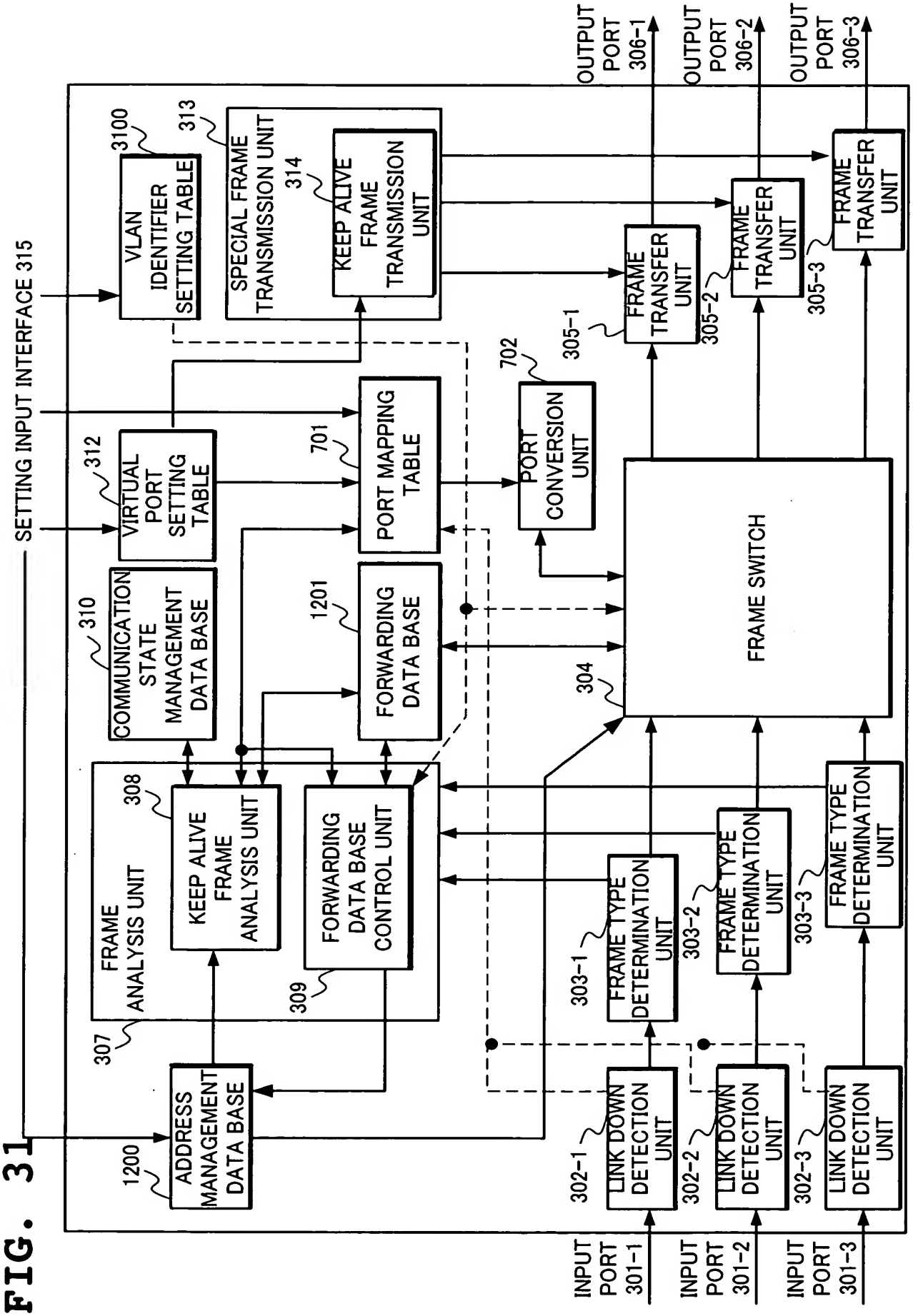

SETTING INPUT INTERFACE 315
VLAN IDENTIFIER SETTING TABLE
3100
SPECIAL FRAME TRANSMISSION UNIT
313
KEEP ALIVE FRAME TRANSMISSION UNIT
314
VIRTUAL PORT SETTING TABLE
312
PORT MAPPING TABLE
701
PORT CONVERSION UNIT
702
COMMUNICATION STATE MANAGEMENT DATA BASE
310
FORWARDING DATA BASE
1201
FRAME SWITCH
304
FRAME ANALYSIS UNIT
307
KEEP ALIVE FRAME ANALYSIS UNIT
308
FORWARDING DATA BASE CONTROL UNIT
309
ADDRESS MANAGEMENT DATA BASE
1200
FRAME TYPE DETERMINATION UNIT
303-1
303-2
303-3
LINK DOWN DETECTION UNIT
302-1
302-2
302-3
FRAME TRANSFER UNIT
305-1
305-2
305-3
INPUT PORT 301-1
INPUT PORT 301-2
INPUT PORT 301-3
OUTPUT PORT 306-1
OUTPUT PORT 306-2
OUTPUT PORT 306-3

FIG. 32

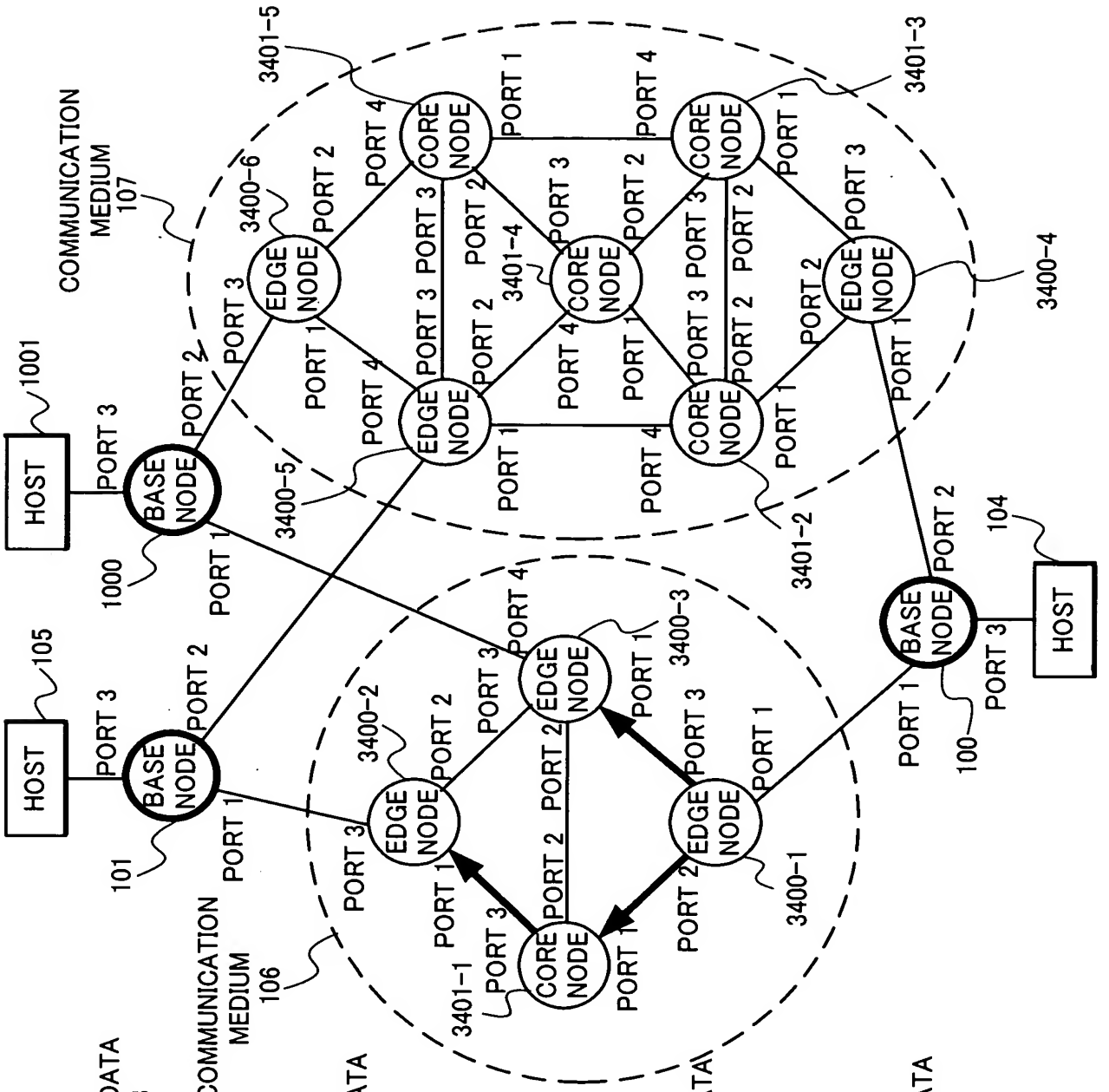
3100 VLAN IDENTIFIER SETTING TABLE

NODE IDENTIFIER 1 OF BASE NODE	NODE IDENTIFIER 2 OF BASE NODE	VLAN IDENTIFIER
MAC ADDRESS OF BASE NODE 100	MAC ADDRESS OF BASE NODE 101	1
MAC ADDRESS OF BASE NODE 100	MAC ADDRESS OF BASE NODE 1000	2
MAC ADDRESS OF BASE NODE 101	MAC ADDRESS OF BASE NODE 1000	3
MAC ADDRESS OF BASE NODE 100	BROADCAST MAC ADDRESS	4
MAC ADDRESS OF BASE NODE 101	BROADCAST MAC ADDRESS	5
MAC ADDRESS OF BASE NODE 1000	BROADCAST MAC ADDRESS	6

FIG. 33

DESTINATION NODE INFORMATION	OUTPUT PORT	IP HEADER INFORMATION
MAC ADDRESS OF BASE NODE 101	PORT 2	IP ADDRESS ASSIGNED TO PORT 2 OF BASE NODE 101
MAC ADDRESS OF BASE NODE 1000	PORT 2	IP ADDRESS ASSIGNED TO PORT 2 OF BASE NODE 1000
MAC ADDRESS OF HOST 104	PORT 2	IP ADDRESS ASSIGNED TO PORT 2 OF BASE NODE 100
MAC ADDRESS OF HOST 105	PORT 2	IP ADDRESS ASSIGNED TO PORT 2 OF BASE NODE 101
MAC ADDRESS OF HOST 1001	PORT 2	IP ADDRESS ASSIGNED TO PORT 2 OF BASE NODE 1000

FIG. 34



3402-4 BROADCAST FORWARDING DATA BASE OF EDGE NODE 3400-3

NODE IDENTIFIER	OUTPUT PORT
3400-1	END

3402-3 BROADCAST FORWARDING DATA BASE OF EDGE NODE 3400-2

NODE IDENTIFIER	OUTPUT PORT
3400-1	END

3402-2 BROADCAST FORWARDING DATA BASE OF CORE NODE 3401-1

NODE IDENTIFIER	OUTPUT PORT
3400-1	PORT 3

3402-1 BROADCAST FORWARDING DATA BASE OF EDGE NODE 3400-1

NODE IDENTIFIER	OUTPUT PORT
3400-1	PORT 2, PORT 3